

## II.—PROF. ALEXANDER'S GIFFORD LECTURES<sup>1</sup> (I.).

BY C. D. BROAD.

PROBABLY few of the courses delivered under the Gifford bequest have been so eagerly awaited by philosophers as Prof. Alexander's. We all knew that he had an extremely ingenious and original system 'up his sleeve'; his scattered articles and his synopsis had served to whet rather than to slake our curiosity; and reports from those who listened to the lectures at Glasgow encouraged the hope that England was at length to produce a comprehensive system of constructive metaphysics in which the speculative boldness of the great Germans should be combined with the critical good sense of Locke, Hume, and Berkeley. On the whole, Prof. Alexander's readers will not be disappointed; they will feel, whether they agree with his conclusions or not, that he has at least produced a work in the grand manner.

The book is of stupendous size, occupying nearly eight hundred pages. It is therefore quite impossible to treat it with anything like adequacy. What I propose to do is to start by giving a neutral account of Prof. Alexander's general conclusions, and then to discuss in somewhat greater detail the arguments by which he supports certain of these.

### SYNOPSIS.

Everything in the universe, according to our author, is a differentiation of one fundamental stuff, called Space-Time. Space without time and time without space are abstractions, legitimate enough when properly defined and used, but contradictory if taken in isolation. S.-T. is really Motion, but we have to remember that it is not the motion of *things* in space during time. Let us call it Pure Motion, and defer for

<sup>1</sup> *Space, Time, and Deity*, S. Alexander, vol. i., pp. xii., 347; vol. ii., pp. xiii., 437. London: Macmillan & Co., 1920.

the present the question whether such a thing be really conceivable. All things are complexes of motions of various kinds, which persist within more or less constant contours. (I think the vortex-atom theory provides a helpful analogy to this view of Prof. Alexander's, though it would certainly misrepresent him if pressed too far.) There are certain features which characterise, in some form or other, all possible bits of S.-T.; these are called Categories. They are in no sense mind-dependent. Different bits of S.-T. will exhibit these general characteristics in different special forms; thus everything will have some shape and size, but one thing will be circular and another square. The particular forms in which a thing exemplifies the categories are the primary qualities of the thing. On the other hand there are qualities which only belong to complexes of a certain degree of complexity; they appear in different forms among different complexes of the right degree of complexity, but they do not belong in any form whatever to those of lower degree. These are called secondary qualities. They are in no sense mind-dependent, nor are they in general dependent on the physiological peculiarities of a percipient's body. Thus any set of motions of the right degree of complexity, when illuminated by the right sort of light (itself a form of motion), is red; and its redness is independent alike of the presence of a percipient mind and of the presence of a normally constructed eye. If either of these be lacking the red colour will not be *seen*, but that is the whole difference that will be made. Secondary qualities form an hierarchy in the sense that those which come higher in the scale belong to motion-complexes which also possess all the lower qualities. Thus the highest secondary quality that we know is mentality; this only belongs to motion-complexes such as brains; but brains also have the secondary qualities of life, chemical affinity, colour, and inertia—to mention them in descending order. Prof. Alexander further holds that a motion-complex with a higher secondary quality is always a distinct part of a larger complex, specially connected with this part, but possessing only lower secondary qualities. Thus our brains, which have mentality as well as life, etc., are specially differentiated parts of our bodies. The remaining parts have life, etc., but not mentality. Similarly he holds that in a blue body the peculiar motions that are blue are merely dotted about the contour, the interstices being filled with simpler motion-complexes which have only mechanical properties. At each new stage in the hierarchy something genuinely new appears in the universe. There is no possibility of predicting that such and

such a type of motion-complex will have such and such a quality until you have actually found that this kind of complex does in fact have this kind of quality. Such novelty is clearly compatible with complete obedience to law; it is a law of nature that such and such a complex has such and such a quality, but it is an *irreducible* law and cannot be discovered until instances of its operation have been met.

On Prof. Alexander's view, then, there is nothing sacrosanct about mind. It is just one stage in the hierarchy of qualities, as closely bound to brain as colour is to certain types of vibration. It happens to be the highest quality that we know; but, in the first place, even if there be higher qualities we could not know them, and, in the second, even if there be not now higher qualities there certainly will be such in course of time. Nothing in the world depends on mind, either for its existence or for even the most trivial of its qualities, with the single exception of value. Prof. Alexander takes an obvious pleasure in 'dressing down' and 'telling off' the exaggerated claims of mind, and I suspect that he secretly cherishes a hope that in the New Jerusalem, whose charter is the Treaty of Versailles and whose streets are paved with paper-currency, this journal may be rechristened SPACE-TIME. The main importance of mind for philosophy is that in it we can read in large and familiar letters types of relation which are common to all orders of existence, but are obscure to us from the very simplicity that they assume in lower orders of reality. There is nothing peculiar about the cognitive *relation*; there is one common relation in which any part of S.-T. stands to any other that affects it. Exactly the same relation of 'compresence' unites me to a book that I read, and a plant to the soil that it grows in. But the quality of the reaction differs, because my brain is so complex as to possess mentality while the plant is only complex enough to possess life. It is for this reason that my relation to the book is called cognitive, whilst the plant's relation to the soil is not. A complex of a given order can stand in this relation to any complex of a lower order, but not to itself or to any other of the same order or *à fortiori* to one of a higher order. A mind 'enjoys,' but does not 'contemplate' itself and its states; a plant 'enjoys' its own life, it cannot 'contemplate' it, though in a wide sense it can contemplate the soil that it lives in and the purely mechanical processes that go on in its own structure.

Now, knowing that I come at a certain stage in a hierarchy of complexes, I can understand that complexes may arise in

the future, or may even exist now, which stand in the same relation to me as that in which my brain stands to the rest of my body. Brain is a highly differentiated part of living matter with the new quality of mentality; so there might be complexes whose constituents are brains, and these might possess a new quality. A being so constituted would contemplate minds as minds contemplate life, and would enjoy its own peculiar quality as minds enjoy themselves. Such a being would be for us a god or angel, and its peculiar new quality would be deity or godhood. In this sense we are gods to plants; for they only live, whilst we think as well as live. But *our* gods would not be gods to themselves; *their* gods would be hypothetical beings of the next stage in the hierarchy. The world, considered as the matrix which is going to produce beings with godhood, is what we mean by God. If this stage be ever reached there will not be God but gods, and their God will be the world regarded as the matrix of the next stage. Thus we may sum up Prof. Alexander's theology in two parodies: 'God never is, but always to exist,' and 'There is no God but gods'.

The one place in Prof. Alexander's system where minds come into their own is in connexion with values. These he calls Tertiary Qualities. Truth, goodness, and beauty would not exist if there were no minds. This does not mean that they are subjective in the sense that there is no question of right or wrong judgment about them. It means that the only entities that have these qualities contain minds as constituents. Truth, *e.g.*, belongs neither to minds as such nor to objects as such, but to the complex mind-contemplating-object. And it is perfectly possible to believe that such a complex has the tertiary quality of truth when, in fact, it has that of falsehood. Moreover, these values are essentially social; they arise out of the intercourse of minds, some of whom are right and others wrong in their judgments or actions. There are analogies to the tertiary qualities at levels below mind. Thus adaptation, or the lack of it, of a plant to its environment is a value, and it is an attribute of the whole situation plant—living in—environment.

There is one other feature in the system that must be mentioned. Prof. Alexander, in common, I suppose, with most philosophers, is concerned to maintain that the actual is logically prior to the possible. Universals for him are types of pattern in S.-T., and are meaningless in any other connexion. And it is owing solely to the actual constitution of S.-T., which is homoloidal, that universals are possible at all. He has therefore to devote a good deal of argument to

apparent exceptions, such as four-dimensional and non-homoloidal spaces, which seem, on the face of them, to be other possible instances of universals which, instead of falling within S.-T., are genera of which actual S.-T. is merely one possible specification.

I have now, I hope, given a fair and intelligible account of the main outlines of Prof. Alexander's theory. The book contains, in addition to what I have mentioned, many very valuable discussions about particular categories such as substance, cause, intensity, etc. But space forbids entering into details. I propose therefore to devote the rest of this article to a fuller account and some criticisms of the doctrines of Space-Time, Mind, the hierarchy of Qualities, the nature of Universals, and Deity.

#### A. SPACE-TIME.

It is idle to pretend that S.-T., as introduced to us in this book, is easy to understand. We must of course distinguish between the doctrine itself and the arguments for it; the latter might be false or inconclusive, whilst the former, if we could understand it, might still be a valuable alternative in terms of which to construe the world. Let us first try then to get some idea of S.-T. For Prof. Alexander the proximately fundamental thing is the event-particle. An event-particle, is the limiting case of a motion; moreover there is a motion-quality—presumably what one is aware of when looking at an object that moves quickly enough—but it is not, like genuine qualities, *correlated with* certain motions, it just is the motion. (Cf. Vol. I., p. 321.) Now motion does not imply something that moves; it is anterior to things and is the stuff of which they are made (I., 329). So it would seem that ultimately the fundamental thing is pure motions. These will differ from each other, of course, in direction, in the place and time where they happen, and so on. But we leave these matters aside for the moment. The intrinsic difference between them will be their swiftness; and if you ask how you are to understand a motion which is not the motion of something, I suppose the answer would be that *e.g.*, you can see a difference between a swifter or slower motion, and that this is independent of what happens to be moving. We are told that the best way to think of an event-particle is to start by thinking of a very simple qualified event—*e.g.*, a flash of red colour. Then think away the quality of redness; the residuum is an event-particle. (Cf. I., 48, note.) Similarly

I suppose that the best way to think of a pure motion is to compare the jump given by the second hand of your watch with that given by the minute hand of a big public clock; then think away the other qualities of the moving object and just bear in mind the observable difference in the perceived jumps. The important point to notice is that for Prof. Alexander the pure motion is not an *abstractum* incapable of actual existence; it is a real particular, which in the special case of the watch-hand happens to have other perceptible qualities. Such pure motions are to be taken as fundamental and unanalysable; space and time are *abstracta* derived from them by a legitimate process. The event-particle is a kind of half-way house between motions and space or time. It is a limit which has spatial and temporal characteristics, and I imagine, also something corresponding to the swiftness of the motion whose limit it is. I think Prof. Alexander might have made all this very much clearer if he had known of Whitehead's work on Extensive Abstraction. It does not seem to me that his exposition of the nature of S.-T. is particularly clear. I have had to gather my notions of it from hints scattered all over the first volume, and my interpretation may quite well be wrong.

Now of course it seems extremely odd to the reader at first sight to take pure motions as fundamental and to analyse space and time out of them. For our normal procedure is to regard motion as analysable into the successive occupation of points of space by a bit of matter or by a recognisable quality or state of affairs. Still we know from experience in other branches of knowledge that it is often equally legitimate to regard A and B as fundamental and to construct C out of them or to regard C as fundamental and construct A and B out of them. Geometry offers many examples of this fact. Hence we ought to regard the *possibility* of Prof. Alexander's procedure with an open mind. But he holds that we ought to go much further than this; for he thinks he can prove that there are contradictions in space and time taken by themselves, and that these only vanish when they are taken in connexion with each other as characteristics of pure motions. Thus two questions arise: (i) Does Prof. Alexander succeed in constructing space and time from his S.-T. of pure motions? and (ii) Is it *necessary* to proceed in this way; is there really any objection to the more usual course which makes motion derivative?

The derivation of space and time occurs in the chapter on Perspectives and Sections of S.-T. Once more I must put the matter in my own words, and it may be that I have mis-

understood the theory. Take any event-particle  $e_{st}$ . If I am right, this will have a spatial characteristic  $s$ , a temporal characteristic  $t$ , and a 'quality' corresponding to the swiftness of the motion of which it is a limit. We must not suppose that the  $s$  and  $t$  factors are really separable; they are essentially bound up with each other and I suppose that the intensive quality of swiftness is the way in which the two are combined. Now (a) we can consider all the event-particles contemporary with  $e_{st}$ . These constitute a *section*. We might be inclined to say that the  $s$ -factors of all such particles is what is meant by space at the moment  $t$ . This would be a mistake according to Prof. Alexander. The reason apparently is that even by space *at a moment* we do not mean *instantaneous space*. Nothing instantaneous would have the properties of a space, for reasons which we shall have to consider later. I would remark at this point, however, that it is not obvious why a section should not be at least as legitimate a notion as an event-particle. Doubtless a space of contemporary points is a conceptual limit, but then so is an event-particle. However, there is another way of classifying points with respect to a given event-particle, and this provides another and—according to Prof. Alexander—more legitimate meaning of space at an instant. We can consider (b) the class of all event-particles, which are either (i) intrinsically contemporary with  $e_{st}$ , or (ii) are earlier stages of motions of which the assigned particle is a stage, or (iii) are later stages of such motions. This class is called a *perspective* with respect to  $e_{st}$ . It obviously includes event-particles of various dates. The  $s$ -factors of all these constitute space at  $t$  from the point  $s$ . Such a perspective of course includes many sets of contemporary event-particles, but many event-particles contemporary with any such set will fall outside the perspective to which the set belongs. *E.g.*, two flashes of light and a sound might start at the same moment from points equidistant from  $e_{st}$  and the flashes might pass through  $s$  at  $t$ . The three initial events would then be intrinsically contemporary; but the starting of the two flashes would be in the perspective while that of the sound would not, because it could not—owing to its smaller velocity—be on a course of motion that contains  $e_{st}$ .

A difficulty that I feel about this notion of perspectives is the following: We are here supposed to be at the level of pure unqualified space-time. But all examples of perspectives have been in terms of definite qualified events with characteristic rates of transmission, such as light or sound. Now the question is: Could one attach any meaning to perspectives



without these characteristically different velocities of transmission, and are not these velocities merely empirical, *i.e.*, characteristic of special complexes of S.-T. and not of S.-T. as such? I question the legitimacy of the notion of perspectives at the level of pure S.-T. If Prof. Alexander answers that there are differences of intensive magnitude even among *pure* motions, there is another question that I must raise. An event-particle is a limit, a kind of mathematical device, *bene fundatum* indeed, but not a genuine part of S.-T. Is it supposed to represent in some way, not only the spatial and temporal characteristics of a certain stage in a pure motion, but also the intensity of the motion (*i.e.*, its velocity)? On the one hand this seems necessary if there be intrinsic differences of intensity even among pure motions, and if event-particles are to be an adequate device for dealing with such motions. But, on the other, in the doctrine of perspectives a *single* event-particle is assumed to belong to various motions of various degrees of swiftness, *e.g.*, to the course of a wave of sound and to that of a wave of light which arrive at the same time. I confess that I find this very puzzling. If pure motions do not differ intrinsically perspectives seem out of place at the level of pure S.-T. But if they do then I do not see how you can talk of a single event-particle common to a number of intrinsically different motions; it would rather seem as if we should need a plurality of event-particles with the same spatial and temporal factors but some difference in quality to represent the different intrinsic swiftnesses of the different pure motions of which they are the limits.

To proceed. Two different kinds of sections and perspectives are possible with respect to a given event-particle  $e_{st}$ . We might consider the class of event-particles co-punctual with  $e_{st}$ , and say that the  $t$ -factors of all these constitute time at the point  $s$ . Again Prof. Alexander will not allow this, because in his view it is essential that time—even if it be in a certain sense time *at a point*—shall not have all its instants confined to one point. Accordingly, instead of such a section, we take a new kind of perspective. We include in it (i) all event-particles co-punctual with  $e_{st}$ , and (ii) otherwise include the same event-particles as in our previous perspective. We now consider the temporal factors of all these particles. Thus the 'temporal perspective' from  $e_{st}$  includes event-particles of the form  $e_{st'}$  but none of the form  $e_{rt'}$ , whilst the 'spatial perspective' includes particles of the form  $e_{rt'}$  but none of the form  $e_{st'}$ ; for the former refers to a centre with fixed spatial characteristics and the latter to a centre



with fixed temporal characteristics. This, at least, is how I interpret the rather difficult statements in I., 75-76.

S.-T. as a whole is just all the pure event-particles. Any perspective is a selection of event-particles. In any perspective every position in space and every instant of time is represented by *some* event-particle, but there are many event-particles absent from any given perspective. Perspectives are inter-connected and include between them all event-particles. 'Points of space which are simultaneous in one perspective may be successive in another . . .' (I., 77). I take this startling statement to be a Pickwickian way of asserting that the perspective  $P_1$  may contain the event-particles  $e_x$  and  $e_y$ , whilst the perspective  $P_2$  may contain  $e_x$  and  $e_z$ .

I find some difficulty in following Prof. Alexander's account of *total space* and *total time*, and their connexion with sections. His view *seems* to be the following: Total space is the space-factors of all event-particles, and total time is their time-factors. But if  $s$  be any point there are event-particles of the form  $e_{st}$ , where  $t$  ranges over all possible values. Similarly if  $t$  be any moment there are event-particles of the form  $e_{st}$  where  $s$  ranges over all possible values. Thus, whilst a section is not what we mean by space, because space confined to a moment is impossible; yet, since every position is in fact correlated with any moment, such a section does contain every position in total space. Similar remarks apply to temporal sections and total time. Thus momentary spaces and punctual times, though fictions, do possess respectively all the geometrical properties of total space and all the chronological properties of total time.

I must confess, however, that I am highly doubtful of the above interpretation, because there are statements that seem to imply and others that seem to conflict with it. We are told (I., 81) that 'in total S.-T. each point is in fact repeated through the whole of time, and each instant over the whole of space'. This certainly seems to mean that for any  $s$  there are  $e_{st}$ 's in which  $t$  ranges through all possible values, and *mutatis mutandis* for any  $t$ . But we also read on the same page that 'at any moment of its real history Space is not all of one date, and Time is not all at one point'. And on (I. 82-83) we learn that '... in their combination Space is always variously occupied by Time, and Time spread variously over Space'. This certainly seems to mean that if  $t$  be any moment the  $s$  values of the  $e_{st}$ 's do *not* range over all possible values. I take it that the odd statement that at any moment of its history Space is not all of one date must be

regarded as analytical. It simply tells us what Prof. Alexander intends the phrase *Space at such and such a date* to mean. It tells us that he means by it the spatial factors of the event-particles in a perspective taken from an event-particle with the assigned date. These factors of course belong to particles of various dates. The only way that I can see to reconcile the apparent flat contradiction between the quotations from I., 81, and I., 82-83 is to substitute in the latter for the words *Space* and *Time* the phrases: *The space of a perspective* and *The time of a perspective*. I may be very stupid, but I feel that more light is badly wanted here.

On I., 217 occurs the statement "... every point differs from any other by its instant, and every instant by its point". Such assertions are common, yet (a) the phrases *its point* and *its instant* seem to imply a one to one correlation between points and instants. This is elsewhere vigorously denied. Each point belongs to a plurality of instants and conversely. We might then (b) be tempted to substitute *its points* and *its instants*, and to suppose that what is meant is that if  $t_1$  and  $t_2$  be two different moments, then some at least of the  $s$ 's in the class of event-particles of the form  $e_{\alpha_1}$  are different from the  $s$ 's in the class of particles of the form  $e_{\alpha_2}$ . But this seems incompatible with the statement that each moment is at every point and each point at every moment. Again (c) we are repeatedly told that there are intrinsically contemporary points, i.e., that there are event-particles with the same time-factor and different space-factors. A pair of such points *cannot* differ from each other by 'their instants,' for 'their instants'—i.e., those of the event-particles of which they are the space-factors—are identical.

It seems to me then that the doctrine of S.-T. and its connexion with space and time is by no means clear, and that, as expounded, it contains inconsistencies. These *may* be merely verbal; they certainly need further elucidation from Prof. Alexander; and, until this be given, I do not feel certain that S.-T., as offered, is even a possible way of analysing the world. But our author thinks it not merely possible but necessary, because of the failure of all alternatives that try to do without it. Let us then consider his arguments for this view.

The argument substantially is that time without space and space without time involve contradictions which vanish only when the two are regarded as intimately linked factors of pure events. Before discussing this view in detail it is well to note that the time and space which are convicted of these

faults are *assumed* to be neither qualities of things or events nor relations between them. Now, it is at least possible that if the difficulties that arise be genuine, they are due not to the separation of time and space, but to the initial assumption that time and space are not merely relations between events.

Time is a continuous duration of successive instants. If time were alone this combination of attributes would be impossible; it is only because time is essentially connected with space that successive instants can form a continuous duration. The argument is that a duration involves some kind of togetherness. But the essence of successiveness is that, when one moment exists, all earlier moments have ceased and no later ones have begun to be. Hence time would be a series of isolated *nows*. This argument seems to me to be wholly invalid. All that has happened to the past moments is that they have ceased to be *present*—a purely psychological matter, as Prof. Alexander admits—not that they have ceased to *be*. Togetherness, as Prof. Alexander himself points out, means merely connexion and not simultaneity (I, 46). Nothing has been proved except the trivial proposition that successive moments cannot be together in the sense of being contemporary. It does not follow that they cannot be together in the sense of forming a whole of related terms, which whole is a duration. A tune is a whole of related notes, and these notes are successive; why cannot a duration be a whole of related but successive moments?

How is connexion with space supposed to heal the impermanence of time? This is explained in I, 44-49. Each moment must be correlated with several points, and each point with several moments. A point has permanence because correlated with many instants. And successive instants are 'together' as parts of a duration because they are correlated with these persistent points. It would, perhaps, be fair to put Prof. Alexander's argument as follows: There can be no duration unless something endures. The moments of time do not endure, therefore something is needed other than time to give a duration. This something is the point or points correlated with all the moments of a series. And these points endure because each of them is correlated with a number of moments. The argument rests on the fallacy that a complex of related terms cannot have a property not possessed by any of the terms. No instant endures; the terms of duration are instants; but it does not follow that a complex whose terms are instants related by the relation of succession is not just what we mean by a stretch of duration:

*e.g.*, Trinity College has certain attributes which belong neither to the Master nor to any of the Fellows; yet it just is a complex composed of the Master and Fellows in certain mutual relations.

Space, according to Prof. Alexander, is under reciprocal obligations to time. Were it not for time space would be a blank undifferentiated unity, and consequently not a continuum at all. This argument seems to rest on some form of the Identity of Indiscernibles. It is assumed that if  $p_1$  and  $p_2$  be two different points there must be some qualitative difference between them. Pure space cannot supply these differences; we are not allowed to appeal to qualified things or events because of the preliminary rejection of the relative theory of space and time; hence time itself must be called in to provide the qualitative distinction. How does time perform this service for space? In I., 49-50 we learn that each instant must be correlated with several points of space if time is to differentiate space. This is apparently necessary in order that time should be successive; otherwise it would 'be infected with bare blank extendedness'. But once the successiveness of time is secured it is able to discriminate points of space, presumably because different points are correlated with different instants or sets of instants.

Now I confess that I find all this most difficult to follow and still more so to believe. It does look as if space and time were attempting, like the inhabitants of the Scilly Islands, 'to gain a precarious livelihood by taking in each other's washing'. For let us put together the various statements about the mutual services of time and space: (i) There are stretches of time, in spite of the fleeting character of instants, because each instant is connected with an enduring point; (ii) points endure because each point is connected with a plurality of different instants; (iii) instants differ because each is connected with a (partially or totally?) different set of points; (iv) points differ because each is connected with a (partially or totally?) different set of instants. To these propositions we have to add the puzzling statement, already quoted, that 'each point is in fact repeated throughout the whole of time, and each instant over the whole of space' (I., 81). How the first four statements can escape circularity and how the one just quoted can be reconciled with (iii) and (iv), passes my wits to understand.

I suppose Prof. Alexander would take the line that this circularity just shows the intimate connexion of time with space. But this seems to me to be no answer. We were given to understand that time *without* space and space *without*

time involved contradictions, but that these were healed when the two were *taken together*, and that this contradiction in the separate factors and its disappearance in their combination was the great argument in favour of the doctrine of S.-T. But it seems (a) that the contradictions do not exist and (b) that, if they do, they only vanish to make way for vicious circles.

Prof. Alexander is not content with the general connexion between space and time which is supposed to be established by the above arguments. He thinks he can prove the more detailed proposition that the characteristics of temporal order depend on the connexion of time with a space of three dimensions. If space had but one dimension time would not be irreversible; if space had but two dimensions there would be no betweenness in time. I cannot follow these arguments, in spite of the very kind and courteous help that Prof. Alexander has given me by letter. I shall try to give an account of his argument to prove the first point, and shall state the difficulties that I feel, although he holds that I ought not to feel them.

The argument begins on I., 52; I shall put it in my own words. If  $t_1$  and  $t_2$  be two instants and  $t_1$  precedes  $t_2$ , then  $t_2$  cannot precede  $t_1$ . It is required to prove that if space had only one dimension  $t_2$  might precede  $t_1$  although  $t_1$  precedes  $t_2$ . Take two event-particles  $e_{s_1, t_1}$  and  $e_{s_2, t_2}$ . Prof. Alexander says that 'the points  $s_1$  and  $s_2$  suffice to distinguish the instants . . . but not to determine whether  $t_1$  is prior to  $t_2$ , as posterior'. (I have altered the notation, but made no other change.)

Before considering his proof there are two points to be noticed: (a) The statement that the points  $s_1$  and  $s_2$  suffice to distinguish  $t_1$  and  $t_2$  seems inconsistent with other statements that he makes. The same instant can be, and is, according to him, connected with a plurality of points. Hence the mere fact that the points  $s_1$  and  $s_2$  differ does not *suffice* to distinguish  $t_1$  and  $t_2$ . If he means that the difference of points *would* suffice to distinguish the moments if space had only one dimension, this is surely one of the things to be proved. (b) There is a defect in the conclusion of the argument, which is, I think, merely verbal. Prof. Alexander claims to prove that if space had only one dimension  $t_1$  might be *either* before *or* after  $t_2$ . This would be an irrelevant conclusion; what he wants to prove is that  $t_1$  might be *both* before *and* after  $t_2$  if space had only one dimension. The defect is only verbal, because if his argument proves anything at all it does prove the latter proposition. Let us now

consider the argument. It runs as follows:  $t_1$ , like all instants, must be repeated in space. Hence there must be an event-particle  $e_{s_1, t_1}$  as well as  $e_{s_2, t_1}$ . Now, if space had only one dimension, and thus reduced to a line,  $s_1$  might be on one side of  $s_2$ —the point connected with  $t_2$ —whilst  $s_2$  was on the other side of it. Indeed this must be so, for 'if  $s_1$  and  $s_2$  were on the same side of  $s_2$  their dates would be different,' whereas they are assumed to be both  $t_1$ . And if  $s_1$  and  $s_2$  were on different sides of  $s_2, t_1$ —which is connected with both  $s_1$  and  $s_2$ —would be both before and after  $t_2$ , which is connected with  $s_2$ . Put in terms of event-particles the argument is: There must be at least two event-particles in different places both with the date  $t_1$ . If space be one-dimensional these places must be on the same line as any other event-particle  $e_{s_2, t_2}$ . They cannot both be on the same side of this particle, for, if so, their dates would differ. But if they were on opposite sides of it their identical date  $t_1$  would be both before and after the date  $t_2$  of  $e_{s_2, t_2}$ .

It is, of course, evident that this very obscure argument rests on the fact that event-particles are limits of pure motions. If space were of one dimension all motions would be in one line. If we conceive of  $s_1$  and  $s_2$  as being successive points in the course of a single pure motion from  $s_1$  to  $s_2$ , it is, of course, obvious that any point between  $s_1$  and  $s_2$  will be correlated with a date between  $t_1$  and  $t_2$ , and that any point  $s_3$  on the opposite side of  $s_2$  to  $s_1$  will be correlated with a date later than  $s_1$ . On this assumption it is no doubt true that  $t_1$  cannot be connected with two different points; if there is only one motion there must be a one to one correlation between space and time, whilst it is of the essence of the theory that every point is connected with many instants and every instant with many points. But I do not understand why the one-dimensionality of space implies that the universe consists of a single motion. In the first place are there or are there not supposed to be intrinsic differences of velocity among pure motions? If so, the present difficulty does not arise. But if not, how can the doctrine of perspectives be—as it is apparently meant to be—a doctrine about *pure* S.-T.? Again, even if all pure motions were in one line and of one velocity what prevents some from traversing the line in one direction and others in the opposite direction? And what prevents a succession of pure motions with the same velocity from traversing the line in the same direction, and thus passing through the same point at different dates? Lastly, what prevents a plurality of pure motions of the same velocity from starting in the same direction at the same

moment from different points on the line and thus passing through different points at the same date? I conclude from the note on L, 53 that there is probably some objection to all these suggestions; but I find the whole conception of pure motions so radically obscure that I do not know what properties I may and what I may not ascribe to them.

*(To be continued.)*